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of any year and a little less rapid in those of ten. . . . Admitting the theory of the inheritance of acquired characteristics as proven, a change would have to appear in the parents after a long stay in the United States, and this change would have to be transmitted to the descendants; i. e., the cephalic, facial and other forms would first change in the parents and would then be transmitted to the children. But this is not the case; according to Boas such a change appears *ex novo* in the children as soon as the parents land in America or have lived here a year or two. This is absurd in theory and as a matter of fact these are not the conditions, as I have shown.

Finally, Dr. Sergi says that one is tempted to ask:

Why should the two types tend toward a common form in America? Is it because one finds there one fixed type, either absolutely dolichocephalic or decidedly brachycephalic? Not even such a justification exists, because America, both with regard to her natives and her immigrants, has always had dolichocephalics, mesocephalics and brachycephalics; hence there is no influence of environment which can tend to fix a single cephalic form in either natives or immigrants (p. 11).

The general reader ought to know these facts. The main purpose of my critique, as well as that of the present discussion, is not to answer but to raise the questions in regard to the causes of changes of the cephalic type. Whatever the *prima facie* explanation may be, the causes of the shape of the head can not be solved by Boas's new theory, because it is, as I showed in my critique, "based rather on a cross-section of the facts than on a genetic interpretation of them. It is only a genetic description and explanation of them that can give a trustworthy basis for a theory." Is it not a fact that in a considerable part of present-day anthropological, psychological and pedagogical writings one is led to think that the most primary phenomena have been examined with mathematical accuracy, when as a matter-of-fact there must have been left out of account numerous accompanying conditions which determined, to a greater or less extent, the results of the problem studied.

The main objection to Professor Boas's new theory of the changes in bodily form of

descendants of immigrants in America is that it finds only one causal relation, viz., that between figures and environment, ignoring all biological and methodological factors. He does that in spite of the most recent attempts of biologists to explain all organic and inorganic changes by the principles of "plural effects" and "the limits of possible oscillations" (see especially Petrunkevitch's "Gedanken über Vererbung," Freiburg, 1904). These modern biologists support their theories also by the logic of mathematics; so, for example, the formula comprising the ellipse, the parabola and the hyperbola (where  $r$  and  $\Delta$  are polar coordinates):

$$r = \frac{ep}{1 - e \cos \Delta}$$

is capable of many solutions and thus creates many possibilities. I believe that Professor Sergi is perfectly warranted in characterizing as "absurd" an anthropological theory which claims that human bodily forms are plastic and can be moulded even during the "first generation" and "a short time after the arrival of parents under new surroundings."

To sum up. As the general reader knows, the form of the head is considered by anthropologists as the most unchanging physical characteristic of the human body, so that the scientists classify the race into a few cephalic types. Professor Boas, on the contrary, makes unwarranted, sweeping conclusions that even the shape of the head undergoes far-reaching changes in type due to the new environment, a new theory which is not justified by his own figures and is not based on scientific methods and on the required technique of experimental physical anthropology.

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#### SCIENTIFIC BOOKS

*Pflanzenphysiologie.* By W. PALLADIN. Berlin, Julius Springer. 1911. Pp. vi + 310, figs. in text 180. Price M. 9, paper M. 8.

The new plant physiology from the hand of

Dr. W. Palladin possesses a number of somewhat novel features that will be sure to render it interesting to those dealing with the fundamental principles of physiological science. The present German edition is a translation of the sixth Russian edition of the work, with alterations and additions.

The general view-point of the author and the mode of treatment which characterizes his work are well indicated in the first sentence of the introduction, wherein it is pointed out that the aim of plant physiology is to gain a complete and thorough knowledge of all the phenomena occurring in plants and ultimately to interpret these in terms of the principles of physics and chemistry. From this it may be expected, and it is indeed true, that the present work contemplates plant phenomena more from the standpoint of chemistry and physics than does any one of the already existing treatises on plant physiology.

The book before us is divided into two parts, the first (206 pages) on Nutrition and the second (95 pages) on Growth and Development. The eight chapter headings of Part I. are as follows: (1) Assimilation of Carbon and of the Energy of Sunshine by Green Plants, (2) Assimilation of Carbon and of Energy by Plants without Chlorophyll, (3) Assimilation of Nitrogen, (4) Absorption of Ash Constituents, (5) Absorption of Materials, (6) Movement of Materials in Plants, (7) Material Transformations in Plants and (8) Fermentation and Respiration. In the fourth chapter heading, logic would require the word *assimilation* instead of *Aufnahme* (absorption) for the latter word occurs, as *Stoffaufnahme*, in the fifth heading and the ash constituents are surely materials. The chapters of Part II. are entitled as follows: (1) General Conceptions of Growth, (2) Growth Phenomena Dependent on Internal Conditions, (3) The Influence of the Environment on Growth and Development, (4) Tendril Climbers and Twiners, (5) Movements of Variation [not due to growth], and (6) Development and Reproduction.

In Part I. the treatment is primarily chemical, and it is in respect to the chemical phe-

nomena of physiology that Palladin's book will prove most useful. In the fifth and sixth chapters, dealing with physical matters, the discussion is not as thorough as in the others. Chapter VI., for example, on the movement of material in the plant, contains no mention of H. H. Dixon's excellent and thoroughgoing study on the ascent of the transpiration stream, although the commonly cited experiments of Böhm and of Askenasy (demonstrating the great cohesion of water and the adhesion between it and mercury) are adequately presented. The discussion of root pressure, exudation and guttation is far less complete than that of many chemical processes of which we have no more adequate knowledge than we have of these, and the theoretical consideration of these fundamental occurrences is dismissed with the mere remark that "the causes upon which these phenomena depend have as yet not been determined" (p. 136). The matter of acid secretion (gland action in general) does not receive attention.

It is interesting to note that the toxic substance theory of soil fertility is given due consideration (p. 98 *et seq.*), and that, in this connection, a figure from a U. S. Bureau of Soils Bulletin and one from Dachnowski's recent studies on the toxicity of bog water are reproduced.

The growth of our general conceptions of respiration and related processes in organisms has recently been evidenced by a gradual bringing of the subject of fermentation into more and more intimate relation with so-called normal respiration. Palladin, once for all, places the whole matter upon a proper logical basis by opening the discussion with fermentation and following with the other topic. This, the reviewer thinks, is a marked advance in logical presentation, and it may do much toward clearing away the haziness which so generally obscures the whole subject of plant respiration.

The first two chapters of Part II. present, in an unusually concise manner, the main principles which underlie growth phenomena in general. The third chapter comprises general

but exceptionally complete discussions of the main relations between growth and the environmental factors. Nevertheless, the treatment of the influence of temperature lacks any mention of the conception of the temperature coefficient of growth activity, the chemical principle of Van't Hoff and Arrhenius as recently applied to physiological phenomena, although the author emphasizes the point that the phenological method of summer temperatures for the growing period can not be expected to give anything but the crudest of indications regarding the temperature relation of plants. It seems that enough has already been accomplished with the Van't Hoff-Arrhenius principle to warrant some treatment in a work of this kind. In the section on the influence of light, Palladin points out, as he has done before in the literature, that many of the developmental phenomena which are usually ascribed to light conditions should rather be referred to those of moisture. "All the characteristics of the development of etiolated plants may be explained by the altered transpiration conditions of these plants and by the resulting correlative influences of the individual organs" (p. 257).

In the last chapter of the book the author very happily presents the modern theory of internal secretions (developed from work with animals) as the basis of the physiological control of growth. "Hormones must doubtless also exist in plants." "The various phenomena of growth and of plant form will surely prove to be dependent upon different hormones" (p. 300). Such predictions, together with the activity of animal physiologists in this direction, can hardly fail to exert an accelerating influence upon the development of plant physiology.

In a general way, as clear and readable a book on this subject has not previously appeared. The style is always simple and nearly always characterized by strict logical sequence. The volume is almost without teleological implications, though the purist on this subject may smile at such an obsolescent section heading as, "The Necessity for the Movement of Materials" (p. 122), and the ex-

position thereof, which indicates that *necessity* here means *need* and not *cause*. Such must be regarded as mere slips into hitherto common and now more or less stereotyped modes of expression frequent in biological literature. The more fundamental principles are developed by the historical method, at once placing before the reader the present status of any given question and the names and methods of the workers to whom that status is due. Citations of literature are numerous, but not too numerous, and the western reader will be gratified in finding here a source for references and digests of some of the more important contributions not commonly cited in German, French and English works of this character.

On the whole, the reviewer is inclined to place Palladin's work at the head of the rather short list of books suitable to be placed in the hands of elementary students of plant physiology.

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*Fourth Report of the Wellcome Tropical Research Laboratories at the Gordon Memorial College, Khartoum.* Vol. A, Medical, 404 pp., 23 pls., 118 figs. in text. Vol. B, General Science, 333 pp., 20 pls., 101 figs. in text. ANDREW BALFOUR, M.D., Director. Published for the Department of Education, Sudan Government, Khartoum, by Bailliere, Tindall and Cox, London; Toga Publishing Co., New York City, agents for the United States.

These two highly specialized and elaborately illustrated volumes are filled from cover to cover with the results of research of high order. They are an epitome of the peaceful and effective conquest of the Sudan by the forces of modern science, of biology and chemistry, applied to the problems of the desert and the jungle in the tropics among a people submerged in ignorance and superstition and sunk in racial lethargy. The army of occupation is small, the staff of these laboratories numbering but eleven, including two officers, Captains Archibald and Fry, detailed